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OCCURRENCE AND IDENTIFICATION OF THE PRAIRIE DEER-MOUSE IN CENTRAL MARYLAND

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One of the interesting mammalogical phenomena of recent years has been the discovery of *Peromyscus maniculatus bairdii* at progressively more eastern localities. Osgood (1909) knew this form from no farther east than central Ohio, but by 1942 its distribution in Ohio was reported as statewide (Bole and Moulthrop, 1942). It was reported from the northern panhandle of West Virginia and from northeastern Tennessee by Kellogg (1937, 1939). Mitchell (1934) first recorded it from northwestern Pennsylvania. Richmond and Rosland (1949) and Grimm and Roberts (1950) found it in all counties of Western Pennsylvania and believed it was spreading eastward via roadsides and cultivated fields. The first record for New York was that of Moulthrop (1938), who trapped *bairdii* in Genesee County, in the western part of the state.

More recently, Hamilton (1950) recorded the appearance of *bairdii* in 1947 at Ithaca, New York, an area that has been heavily trapped for 20 years. Hamilton also mentioned the capture of prairie deer-mice at North Harrisburg, Dauphin County, Pennsylvania—the first record of *bairdii* east of the Appalachian Mountains.

The prairie deer-mouse[1] was unknown in Maryland until 1949, when Lucille F. Stickel and Oscar Warbach live-trapped several in crop fields at the Patuxent Research Refuge, Prince Georges County. These fields are about 1.9 miles north of the village of Bowie. They are situated on a wide bench of sandy clay near the Patuxent River, on the upper part of the Atlantic Coastal Plain.

Between May 29 and August 14, 1949, two sexually mature males and three gravid females were brought to the laboratory and caged. The 14 young produced by these females from matings in the wild were reared until about March 1, 1950, when all 19 animals were prepared as skins and skeletons. The litters were then six months two weeks, six months three weeks, and eight months three weeks of age.

The 5 adults and 14 young were compared with many specimens of *bairdii* in the Biological Surveys collection from various localities in the Middle West. No cranial, mensural, or color differences were ob-

[1]Common names used follow the excellent suggestions of Dice (1937).

served. Indeed, the Patuxent specimens could not have been picked out if mixed with certain Middle Western series.

After the first *bairdii* was tentatively identified, all *Peromyscus* (except the five brought to the laboratory) were carefully examined, measured in the field, ear-tagged, and released where caught. Recaptures often permitted more certain identification. Field identifications were checked by comparing measurements with those of known specimens, with the age of the individual in question being considered. Doubt remained about very few released animals.

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The prairie deer-mouse seems to be precariously established at the Refuge. In the year from May 1949 to June 1950, 23 *bairdii* were captured by Mrs. Stickel and Mr. Warbach in connection with population and farm wildlife studies. Fourteen were females and nine were males. Only six were considered juveniles. Deer-mice were at no time common in the fields and did not appear to increase in number. They were far outnumbered by feral house-mice (*Mus musculus*) occupying the same habitat.

Deer-mice were most often caught in corn and in young wheat, both relatively open habitats. Here several individuals had good recapture histories and are known to have bred. Deer-mice were trapped only occasionally in hay or tall wheat. This is in accord with the well known preference of *bairdii* for open, rather exposed sites. Released individuals were often followed to burrows in nearly bare fields.

We do not know if *bairdii* has spread to any uncultivated habitats of the Refuge, but few if any seem suitable for this mouse. It has been found in but one set of adjoining fields, and is not known to have reached the other farm on the Refuge.

P. m. bairdii may not be securely established in this locality, but it definitely is reproducing. All but one of the females were in some stage of breeding whenever caught. Evidence from dates of appearance of very small juveniles, and from the condition of frequently retrapped females, indicates that litters were born in early April, May 1, September 11, and early November. The three caged females bore their litters June 15, August 7, and August 17. Their litters consisted of 6 (one died), 5, and 4 young. Nine of the survivors were males, five females.

It would be interesting to know when and how the local *bairdii* population arrived. Although the species was not found here before 1949, it could have occurred in its present small numbers without being noticed, for there was little trapping in crop fields, and an occasional *bairdii* could have passed for a young *noveboracensis*. It is equally difficult to say how this deer-mouse got here. No doubt the animal is expanding its range by natural means in consequence of artificially created habitats, but the possibility of accidental transportation is considerable. The wide dispersal of the house-mouse is an excellent example. Mice can easily be carried with grain, plants, or other items. We know of instances of mice living in passenger cars for long periods, and they should live equally well in freight shipments. It may be significant that the fields in which *bairdii* has been found on the Refuge are near two equipment barns, a paved road, and a private farm.

SEPARATION FROM *PEROMYSCUS LEUCOPUS NOVEBORACENSIS*

Now that the enviable situation of having but one type of *Peromyscus* no longer exists in this part of the East, local biologists are faced with the necessity of being able to separate *P. m. bairdii* and *P. l. noveboracensis*—not only in the laboratory, but, insofar as possible, in the field. A comparative study of prepared local specimens was made as a basis for both laboratory and field identifications. It was soon found, however, that field measurements of living mice, made by Lucille F. Stickel, differed slightly from those of freshly killed specimens although the same methods of measuring were used. The differences presumably reflect not only individual variation of the specimens, but also the difficulty of getting identical measurements of living and dead mice. The field measurements are therefore considered separately. They may prove more useful to workers doing live-trapping than will the other data, particularly since they include measurements of juveniles. Only specimens from the Patuxent Refuge were used in either set of data. It is not anticipated that the results will hold for other regions, or for every specimen from this region.

Young *bairdii* and fully adult *noveboracensis* are generally recognized as such. The difficulty lies in distinguishing juvenile or subadult woodmice from subadult and adult prairie deer-mice. A few of our specimens suggest that the greatest trouble comes from fall-born *noveboracensis* that fail to attain the usual size during the winter although they are of adult or subadult age and pelage. One individual of this sort began growing again in the spring. It is extremely easy to misidentify such individuals in the flesh. Before attempting identification of questionable specimens, it is desirable to determine age as well as feasible by such indicators as pelage, known history of live-trapped animals, or in the laboratory by tooth wear or ankylosis of epiphyses.

Measurements of total length, tail, and hind foot were made by standard methods. The ear (from notch) was measured in its natural position, neither stretched nor straightened. Cranial measurements were made with vernier calipers. Condylo-incisive length was measured from the front of an upper incisor to the rear of the occipital condyle of the same side. Cranial breadth was measured at the lower ends of the lateral lobes of the parietals, with jaws of calipers held longitudinally along the skull. Length of maxillary tooth row is crown length.

The figure compares variation of freshly killed specimens of both forms in some of the more diagnostic measurements. Length of hind foot is probably the most useful measurement, not only because of its diagnostic value, but also because adult length is attained relatively early in life. The series shown on the graph do not overlap in length of foot, but overlapping certainly would occur in larger series. The following tabulation of field measurements of living mice supplements the graph. Overlapping at 19 mm. will be noted. Four subadult to adult mice of each form had feet of this length.

	Gray Juveniles			Subadults to Adults		
	No.	Range	Av.	No.	Range	Av.
P. m. bairdii	7	16-18	17.1	14	17-19	18.0
P. l. noveboracensis	12	19-20	19.6	27	19-22	20.2

Ear length is a useful character despite overlapping curves of variation. Measurements taken from skin labels, however, must be used with discretion: some of the greater *noveboracensis* ear lengths plotted in the figure were measured by preparators other than the writer and may have been made with ear pulled straight. Measurements of ears of living mice apparently run one or two millimeters lower than those of freshly killed mice. Our field measurements are thus lower than those of figure 1, but seem equally diagnostic:

	Juveniles and Subadults			Young Adults and Adults		
	No.	Range	Av.	No.	Range	Av.
P. m. bairdii	8	10-12	11.4	9	10-14	12.0
P. l. noveboracensis	18	12-16	14.2	18	14-16	14.7

An ear length of 14 mm. was by far the commonest length among living *noveboracensis* of all age groups, but appeared in only two living *bairdii*, one young adult, one adult.

Tail lengths of the two forms also overlap, but the measurement is frequently of value, especially if the approximate age of the individual is known. Part of the overlapping is caused by the increase of tail length until full growth of the individual is reached. Another part of the overlapping is independent of age. For example, the upper limit for adult *bairdii* and the lower limit for adult *noveboracensis* occasionally overlap at about 65 mm., to judge from both field and laboratory data.

Field measurements of gray juveniles of different sizes show tail lengths of 40 to 53 mm. for seven *bairdii*, and lengths of 54 to 76 mm. for twelve *noveboracensis*. The other field measurements are similar to those of the graph, except for a young adult *bairdii* with a tail of 50 mm. and a subadult *noveboracensis* with a tail of 60 mm.

Total length is of little use in the present connection, as it is of diagnostic value only for large or small individuals about which there is seldom any real question.

Cranial breadth reflects the greater size of the brain case in *noveboracensis* better than does cranial depth. The difference between these two mice in size of brain case is often obvious in direct comparison, and is apparent early in life.

Condylo-incisive length of skull is chiefly a function of the greater size of *noveboracensis*. It is of diagnostic value in the present series except for a few young *noveboracensis*.

Length of maxillary tooth row will nearly separate the two series. It is free of age variation once all teeth are erupted, except that individuals with much worn teeth may have a slightly shorter crown length than younger individuals. Length of tooth row is of particular interest because it should make possible accurate determination of the remains of many individuals in predator stomach and scat material.

Shape of the incisive foramina is one of the best characters. These foramina are anteriorly constricted in *noveboracensis*, open and evenly curved anteriorly in *bairdii*. This is true of all our *bairdii*. One of our *noveboracensis* has the *bairdii* condition, and another is intermediate in this respect. This character also should be of value in dealing with food habits materials.

The greater hairiness and sharper bicoloration of the tail of *bairdii* are relative characters of secondary importance. They cannot be wholly relied upon, but are of use in combination with other characters. Young *noveboracensis* may have short, bicolor tails that are as hairy as those of many *bairdii*.

Coloration is of very little value. When our series are compared, *bairdii* averages grayer, duller, and less yellowish on the sides, but some individuals are as bright as many *noveboracensis*. Few specimens other than old red wood-mice could be properly determined by color alone if the series were mixed. Minor color characters, such as white ear tufts, dorsal stripe, rufous rump, color of snout, and others that have been mentioned by various workers, seem more misleading than helpful.

Shape of head of living individuals (see Burt, 1946, p. 204, fig. 94) is of use to workers thoroughly familiar with the animals in life, but impresses us as very difficult to use accurately.

Our approach to identifying these mice in the field is to ascertain the age of each individual as well as possible, and to take measurements of hind foot, ear, and tail. Hairiness and bicoloration of tail and shape of head are also considered. Measurements of questionable individuals are compared with tabulations of field measurements of representative age series of local mice of each form. Frequently some one measurement will conclusively decide an otherwise difficult identification. The tail or the ear may be too long for a juvenile to be *bairdii*, or the foot may be too short for a subadult to be *noveboracensis*. We believe that a degree of accuracy adequate for most field problems can be attained rather quickly in this way. Repeated captures of troublesome individuals may also be highly informative: mice tentatively listed as *bairdii* have grown up to be easily identified *noveboracensis*. Habitat is not relied on in making identifications, for we have often found wood-mice well out into fields.

It is to be expected that some identifications will be probable rather than positive, and that certain individuals cannot be determined in the field at all. This will be especially true, of course, in parts of the country where many specimens cannot be identified satisfactorily even in the laboratory.

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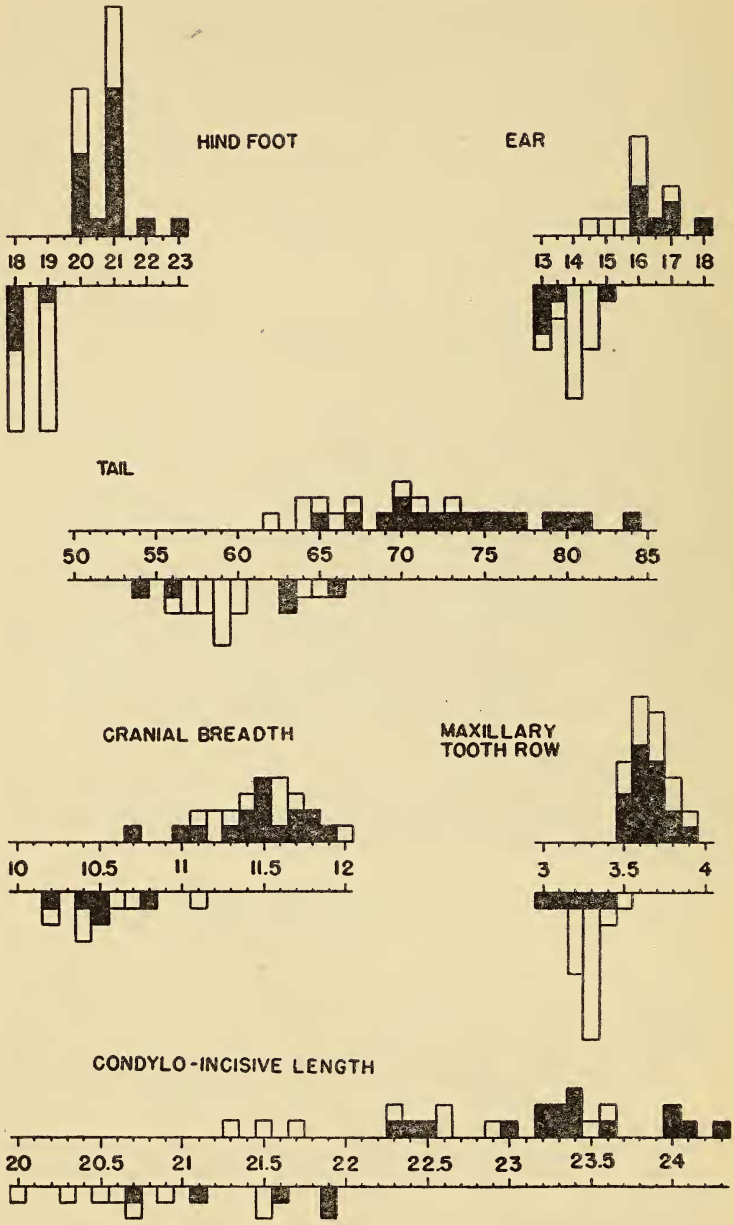
HIND FOOT
18 19 20 21 22 23
EAR
13 14 15 16 17 18
TAIL
50 55 60 65 70 75 80 85
CRANIAL BREADTH
10 10.5 11 11.5 12
MAXILLARY TOOTH ROW
3 3.5 4
CONDYLO-INCISIVE LENGTH
20 20.5 21 21.5 22 22.5 23 23.5 24

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Explanation of Plate.

Measurements of *Peromyscus leucopus noveboracensis* and *Peromyscus maniculatus bairdii* from the Patuxent Research Refuge, Maryland. Data for *P. l. noveboracensis* are above the numbers, *P. m. bairdii* below. One square = one individual. Black blocks represent adults (*noveboracensis* with moderate to much tooth wear; *bairdii* of breeding age when trapped, and then kept alive for several months before preparation). Unshaded blocks represent young (*noveboracensis* with little or no tooth wear; *bairdii* born in laboratory and reared to ages stated in text). No gray juveniles are included. All measurements are in millimeters.